What is claimed is:

1. A method of imaging an artery in a patient using magnetic resonance imaging, comprising,

collecting image data; and

administering magnetic resonance contrast agent to the patient prior to collecting image data, by intravenous infusion, at a rate of infusion sufficient to provide a substantially elevated concentration of the contrast agent in the artery during collection of image data representative of a center of k-space.

2. The method of claim 1 wherein the step of administering a magnetic resonance contrast agent further includes temporally correlating a substantially elevated rate of infusion of the contrast agent with the collection of image data representative of the center of k-space according to at least one of a delay time in a delivery system, a location of the artery and a physical condition of the patient.

3. The method of claim 1 wherein the step of administering the contrast agent to the patient further includes

temporally correlating a maximum rate of infusion of the contrast agent with the collection of image data representative of the center of k-space according to at least one of a delay time in a delivery system, location of the artery and a physical condition of the patient.

4. The method of claim 3 wherein the step of administering the contrast agent to the patient further includes administering a paramagnetic contrast agent at a maximum rate of infusion which is greater than 0.0015 Liters/Kg-sec^2 divided by the relaxivity of the paramagnetic contrast agent.

5. The method of claim 1 wherein the step of administering a magnetic resonance contrast agent further includes administering the contrast agent at a substantially elevated rate of infusion about 10 to about 40 seconds before collection of image data representative of the center of k-space.

6. The method of claim 1 wherein the step of administering the contrast agent to the patient further includes temporally correlating a period of a substantially elevated rate

of infusion with the collection of image data representative of the center of k-space in accordance with a size of the artery so that the concentration of the contrast agent in the artery is substantially greater than veins adjacent to the artery during collection of image data representative of the center of k-space.

7. The method of claim 6 wherein the step of administering the contrast agent to the patient further includes administering the contrast agent at an infusion rate and for a period which provides a substantially elevated concentration of the magnetic resonance contrast agent in the artery during more than 50% of the period of collecting image data representative of the center of k-space.

8. The method of claim 6 wherein the step of administering the contrast agent to the patient further includes administering the contrast agent at an infusion rate and for a period sufficient to provide an elevated concentration of the magnetic resonance contrast agent in the artery for a period of between about 50% to about 85% of the time of collecting image data representative of the center of k-space.

9. The method of claim 6 wherein the step of administering the contrast agent to the patient further includes adapting the timing of a maximum rate of infusion of the contrast agent according to the location of the artery or the physical condition of the patient.

10. The method of claim 1 wherein the step of administering the contrast agent to the patient further includes administering a paramagnetic contrast agent having a relaxivity at a rate of infusion sufficient to provide a concentration of the paramagnetic contrast agent in the artery, during collection of image data representative of a center of k-space, of greater than 2.9 sec/relaxivity.

11. A method of imaging an artery in a patient using magnetic resonance imaging, comprising,

collecting image data; and

administering a magnetic resonance contrast agent to the patient while collecting image data, by intravenous infusion, at a rate of infusion sufficient to provide a substantially

elevated concentration of the contrast agent in artery relative to adjacent veins during collection of image data corresponding to a center of k-space.

12. The method of claim 11 wherein the step of administering a magnetic resonance contrast agent further includes temporally correlating the substantially elevated rate of infusion of the contrast agent with the collection of image data corresponding to the center of k-space in accordance with at least one of a time delay of a delivery apparatus, a location of the artery and a physical condition of the patient.

13. The method of claim 11 wherein the step of administering the magnetic resonance contrast agent further includes temporally correlating a maximum rate of infusion with the collection of image data corresponding to the center of k-space in accordance with at least one of a time delay of a delivery apparatus, a location of the artery and a physical condition of the patient.

14. The method of claim 11 wherein the step of administering a magnetic resonance contrast agent further

includes administering the contrast agent at a substantially elevated rate of infusion about 10 to about 30 seconds before collection of image data corresponding to the center of k-space.

15. The method of claim 11 wherein the step of administering a magnetic resonance contrast agent further includes administering the contrast agent at a maximum rate of infusion about 10 to about 40 seconds before collection of image data corresponding to the center of k-space.

16. The method of claim 11 wherein the step of administering the contrast agent to the patient further includes temporally correlating a period of a substantially elevated rate of infusion of the contrast agent to the collection of image data corresponding to the center of k-space in accordance with a size of the artery so that the concentration of the contrast agent in the artery is substantially greater than adjacent veins during collection of image data corresponding to the center of k-space.

17. The method of claim 16 wherein the step of administering the contrast agent to the patient further includes

administering the contrast agent for a period sufficient to provide a substantially elevated concentration of the magnetic resonance contrast agent in the artery for at least 50% of the period of collecting image data corresponding to the center of k-space.

18. The method of claim 11 wherein the step of administering the contrast agent to the patient further includes adapting the timing of a maximum rate of infusion of the contrast agent according to a location of the artery.

19. The method of claim 11 wherein the step of administering a magnetic resonance contrast agent includes administering the contrast using a mechanical injector which is spring-loaded, pneumatic powered, or electrically powered.

20. The method of claim 11 wherein the step of administering a magnetic resonance contrast agent includes administering the contrast agent using a mechanical injector wherein the mechanical injector includes a non-magnetic spring to pressurize the contrast agent for infusion into the patient.

21. The method of claim 11 wherein the step of administering a magnetic resonance contrast agent includes administering a gadolinium chelate using a mechanical injector which is adapted to receive a vessel containing the gadolinium chelate wherein the mechanical injector includes a non-magnetic spring.

22. The method of claim 11 wherein the step of administering the contrast agent to the patient further includes administering a paramagnetic contrast agent having a relaxivity at a rate of infusion sufficient to provide a concentration of the paramagnetic contrast agent in the artery, during collection of image data corresponding to a center of k-space, of greater than 2.9 sec^{-1} $relaxivity^{-1}$.

23. A method of imaging an artery in a patient using a gadolinium chelate, comprising,

collecting image data; and

administering the gadolinium chelate to the patient, by intravenous infusion, at a rate of infusion for providing a

maximum concentration of the gadolinium chelate in an artery relative to adjacent veins during collection of image data corresponding to a center of k-space.

24. The method of claim 23 wherein the step of administering the gadolinium chelate further includes administering the gadolinium chelate at a maximum rate of infusion which is greater than 0.0015 Liters/Kg-sec^2 divided by the relaxivity of the gadolinium chelate.

25. The method of claim 23 wherein the step of administering the gadolinium chelate to the patient further includes administering a maximum rate of infusion of the gadolinium chelate about 10 to about 40 seconds before collecting image data corresponding to the center of k-space.

26. The method of claim 23 wherein the step of administering the gadolinium chelate further includes temporally correlating a maximum rate of infusion of the gadolinium chelate with the mapping of k-space in accordance with a delay time in a delivery system, a location of the artery or a physical condition of the patient.

27. The method of claim 23 wherein the step of administering the gadolinium chelate to the patient further includes temporally correlating a period of the maximum concentration of the gadolinium chelate to the collection of image data corresponding to the center of k-space in accordance with a size of the artery.

28. A method for administering a magnetic resonance contrast agent into a vein of a patient to enhance a magnetic resonance image of an artery of the patient, the method including:

collecting image data; and

administering the contrast agent into the vein at an infusion rate and for a period of time sufficient to provide a maximum concentration of the contrast agent in the artery during collection of at least a portion of the image data which corresponds to a center of k-space.

29. The method of claim 28 wherein the step of administering a magnetic resonance contrast agent further includes temporally correlating a maximum rate of infusion of

the contrast agent with the mapping of k-space in accordance with a delay time in a delivery system, a location of the artery or a physical condition of the patient.

30. The method of claim 28 wherein the step of administering the contrast agent to the patient further includes administering a paramagnetic contrast agent at a maximum rate of infusion which is greater than 0.0015 Liters/Kg-sec^2 divided by the relaxivity of the contrast agent.

31. The method of claim 28 wherein the step of administering the contrast agent to the patient further includes temporally correlating a period of an elevated rate of infusion of the contrast agent with the mapping of k-space in accordance with a size of the artery so that the concentration of the contrast agent in the artery is substantially greater than adjacent veins while collecting image data corresponding to the center of k-space.

32. The method of claim 31 wherein the step of administering the contrast agent to the patient further includes administering the contrast agent at an infusion rate which

provides a substantially elevated concentration of the magnetic resonance contrast agent in the artery relative to adjacent veins for at least 50% of the time of the step of collecting image data corresponding to the center of k-space.

33. The method of claim 28 wherein the step of administering a magnetic resonance contrast agent includes administering the contrast agent using a mechanical injector which is spring-loaded, pneumatic powered, or electrically powered.

34. The method of claim 28 wherein the step of administering a magnetic resonance contrast agent includes administering a gadolinium chelate using a mechanical injector which is adapted to receive a vessel containing the gadolinium chelate wherein the mechanical injector includes a non-magnetic spring to pressurize the contrast for infusion into the patient.

35. The method of claim 34 wherein the step of administering the contrast agent to the patient further includes administering gadolinium chelate at a maximum rate of infusion

which is greater than 0.0015 Liters/Kg-sec^2 divided by the relaxivity of the contrast agent.

36. A magnetic resonance compatible apparatus for administering a magnetic resonance contrast agent into a vein of a patient to enhance a magnetic resonance image of an artery of the patient, the apparatus comprises:

a spring-powered device, including a non-magnetic spring, for administering the contrast agent into the vein at an infusion rate and for a period of time sufficient to provide a substantially elevated concentration of the contrast agent in the artery during collection of at least a portion of the image data which corresponds to a center of k-space.

37. The apparatus of claim 36 wherein the magnetic resonance contrast agent is contained in a syringe having an orifice at a distal end and a plunger for engaging the contrast agent, the syringe being coupled to the spring-powered device such that the spring-powered device engages the plunger to administer the contrast agent at an infusion rate in the range of about 4 ml/minute to about 600 ml/minute.

38. The apparatus of claim 36 further including a rate adjustment mechanism coupled to the plunger of the syringe to adjust the infusion rate of the contrast agent.

39. The apparatus of claim 36 further including a fluid flow restrictor coupled to the orifice of the syringe to control, in combination with the non-magnetic spring, the infusion rate of the contrast agent.

40. The apparatus of claim 39 wherein the fluid flow restrictor is a needle, a precision orifice, or tubing having a narrow calibre.

41. The apparatus of claim 39 further including a rate adjustment means for adjusting the infusion rate of the contrast agent.

42. The apparatus of claim 36 further including a flow rate indicator to visually or audibly indicate the infusion rate of the contrast agent.

43. The apparatus of claim 36 wherein the non-magnetic spring is comprised of eljaloy or inconel.

44. The apparatus of claim 36 wherein the spring-powered device administers a paramagnetic contrast agent having a relaxivity at a rate of infusion sufficient to provide a concentration of the paramagnetic contrast agent in the artery of greater than 2.9 sec^{-1} relaxivity[1] during collection of a portion of the image data which corresponds to a center of k-space.

45. An apparatus for administering a magnetic resonance contrast agent into a vein of a patient to enhance a magnetic resonance image of an artery of the patient, the apparatus comprises:

an infusion mechanism, including infusion means for matching an infusion rate with a mapping of at least a portion of k-space and for infusing the contrast agent at a rate and a duration sufficient to provide a maximum concentration of the contrast agent in the artery during collection of at least a portion of image data which corresponds to a center of k-space.

46. The apparatus of claim 45 wherein the administration means is a mechanical injector which is spring-loaded, pneumatic powered, or electrically powered.

47. The apparatus of claim 46 wherein the administration means is coupled to a container having the magnetic resonance contrast agent contained therein.

48. The apparatus of claim 47 wherein the container includes an orifice and wherein the apparatus further includes a fluid flow restrictor coupled to the orifice.

49. The apparatus of claim 48 wherein the fluid flow restrictor is a needle, a precision orifice, or tubing having a narrow calibre.

50. The apparatus of claim 45 further including a rate adjustment means for adjusting the infusion rate of the contrast agent to the patient.

51. The apparatus of claim 45 further including a flow rate indicator to visually or audibly indicate the infusion rate of the contrast agent.

52. An apparatus for injecting a magnetic resonance contrast agent into a patient, comprising,

an injection mechanism to match a substantially elevated contrast agent concentration in the artery relative to the adjacent veins with a mapping of k-space by controlling the rate of injection of the contrast agent such that a substantially elevated rate of injection correlates with the collection of image data corresponding to a center of k-space.

53. The apparatus of claim 52 wherein the injection mechanism temporally correlates the substantially elevated rate of injection with the collection of image data corresponding to the center of k-space in accordance with a location of the artery.

54. The apparatus of claim 52 wherein the injection mechanism temporally correlates a maximum rate of injection of the contrast agent with the collection of image data

corresponding to the center of k-space in accordance with a location of the artery.

55. The apparatus of claim 52 wherein the injection mechanism provides a substantially elevated rate of injection of the contrast agent about 10 to about 40 seconds before collecting image data which corresponds to the center of k-space.

56. The apparatus of claim 52 wherein the injection mechanism provides a maximum rate of injection of the contrast agent about 10 to about 30 seconds before collecting image data which corresponds the center of k-space.

57. The apparatus of claim 52 wherein the injection mechanism temporally correlates a period of a substantially elevated rate of injection of the contrast agent with the collection of image data corresponding to the center of k-space in accordance with a size of the artery so that the concentration of the contrast agent in the artery is substantially greater than adjacent veins while collecting image data which corresponds to the center of k-space.

58. The apparatus of claim 57 wherein injection mechanism injects the contrast agent into the patient at a rate and duration of injection which provides a substantially elevated concentration of the magnetic resonance contrast agent in the artery for at least 50% of the time of collecting image data corresponding to the center of k-space.

59. The apparatus of claim 52 wherein the injection mechanism injects a paramagnetic contrast agent having a relaxivity at a rate of injection sufficient to provide a concentration of the paramagnetic contrast agent in the artery, during collection of image data representative of a center of k-space, of greater than 2.9 sec^{-1} $relaxivity^{-1}$.